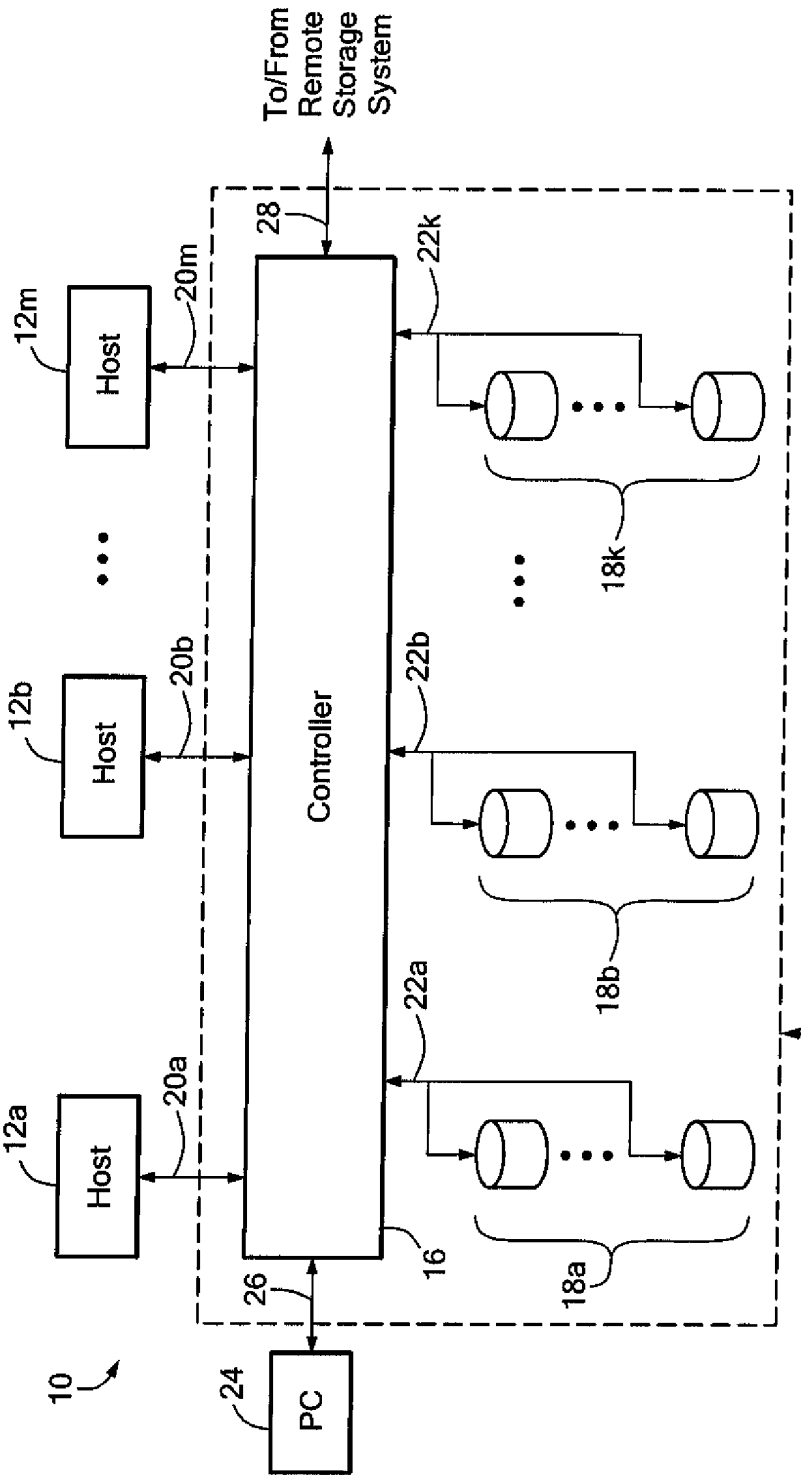
To/From Remote Storage System
28
22k
20m
12m
Host
18k
22b
20b
12b
Host
Controller
18b
22a
20a
12a
Host
18a
16
14
26
10
24
PC

FIG. 1

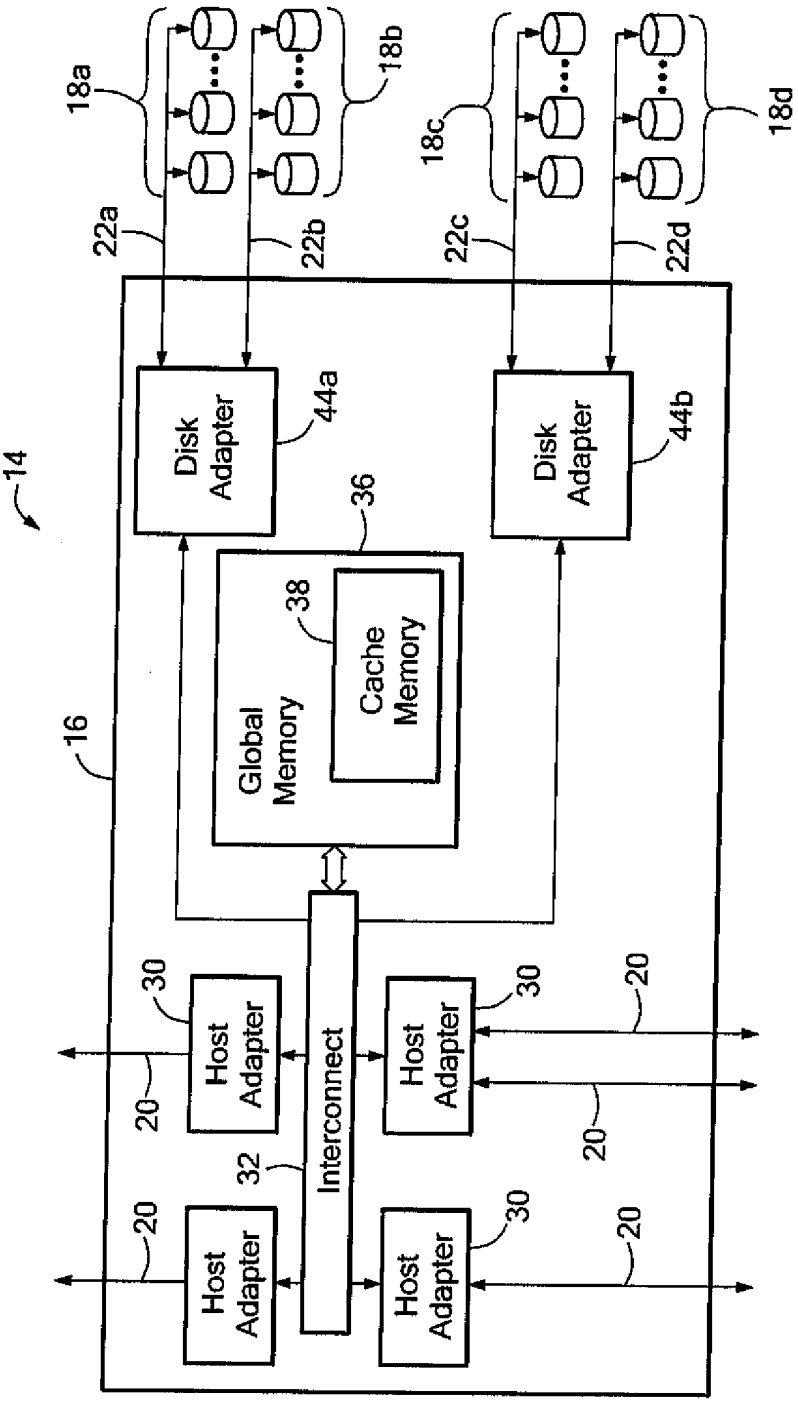
14
16
18a
18b
18c
18d
22a
22b
22c
22d
Disk Adapter
44a
Disk Adapter
44b
36
Global Memory
38
Cache Memory
Interconnect
32
Host Adapter
30
20

FIG. 2

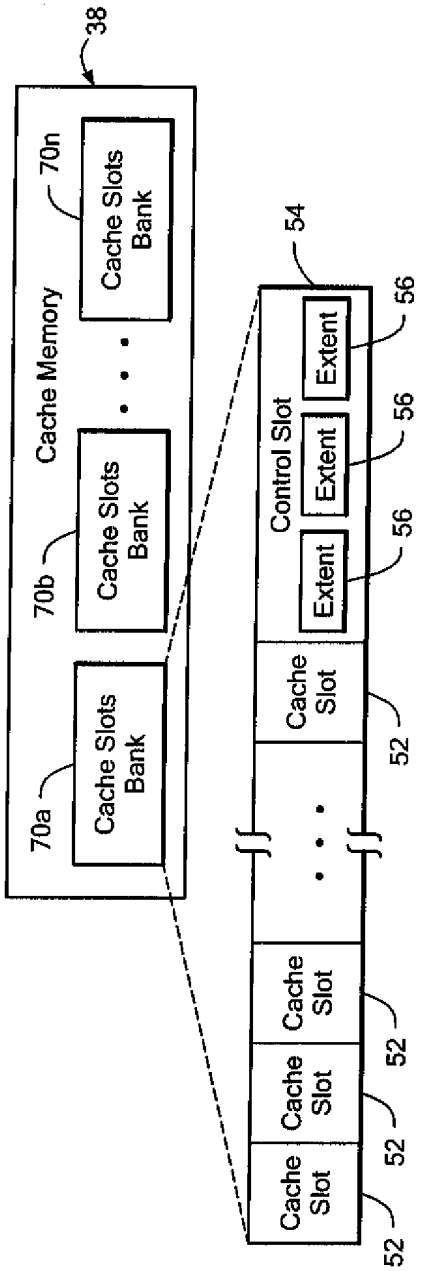
38
Cache Memory
70a
Cache Slots Bank
70b
Cache Slots Bank
70n
Cache Slots Bank
Cache Slot
52
Control Slot
54
Extent
56

FIG. 3A

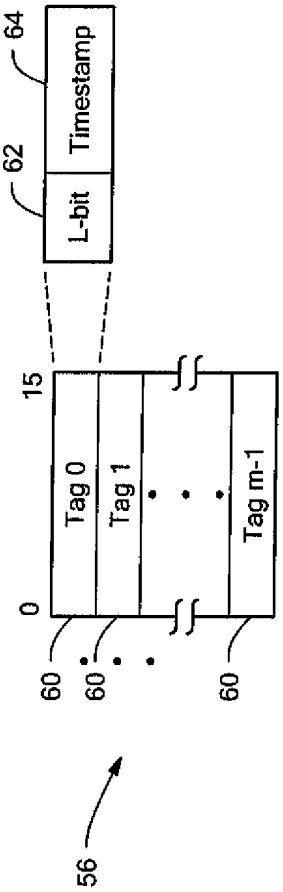
64
Timestamp
62
L-bit
15
0
Tag 0
Tag 1
Tag m-1
60
56

FIG. 3B

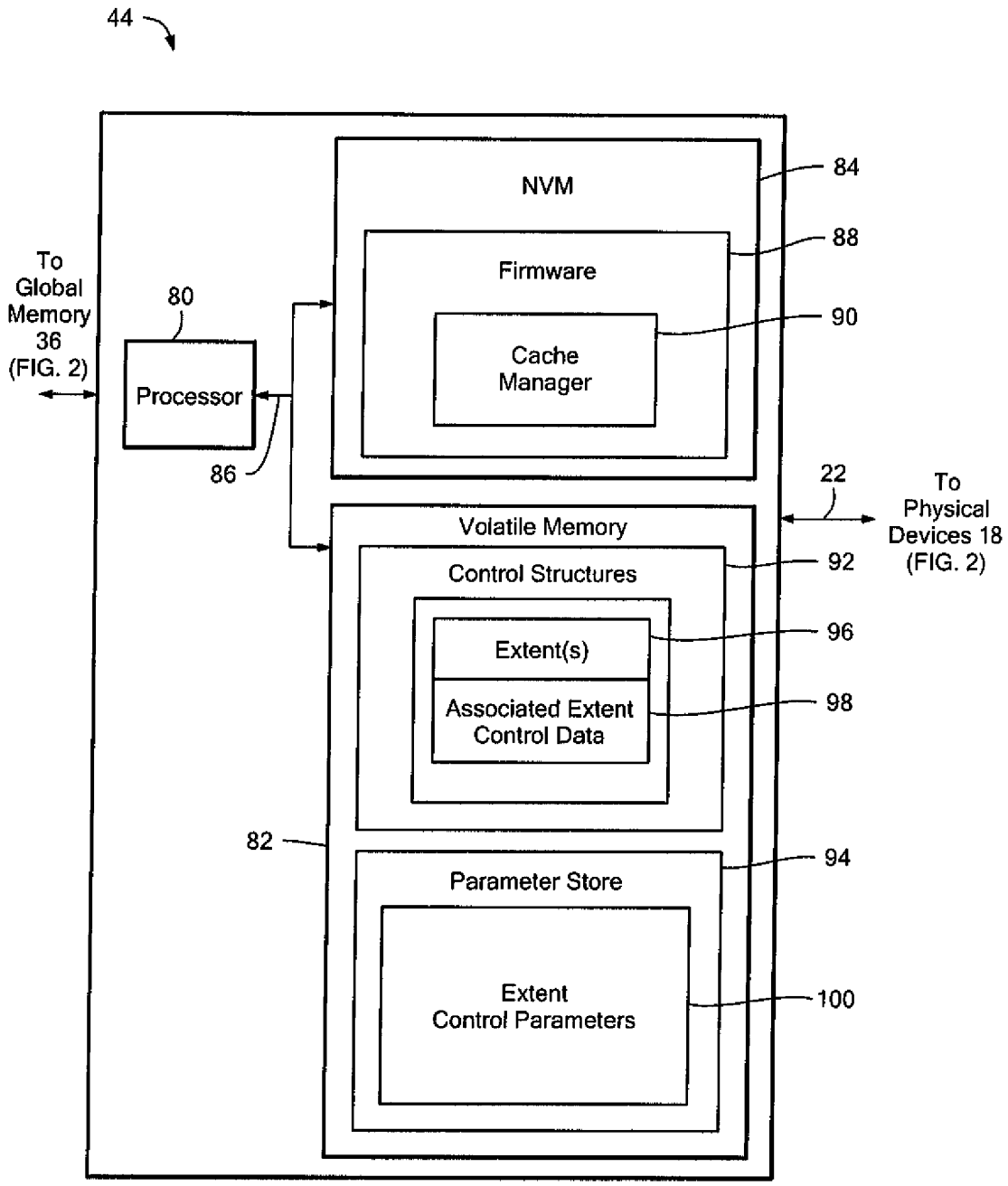
44
NVM
84
Firmware
88
Cache Manager
90
To Global Memory 36 (FIG. 2)
80
Processor
86
22
To Physical Devices 18 (FIG. 2)
Volatile Memory
Control Structures
92
Extent(s)
96
Associated Extent Control Data
98
82
Parameter Store
94
Extent Control Parameters
100

FIG. 4

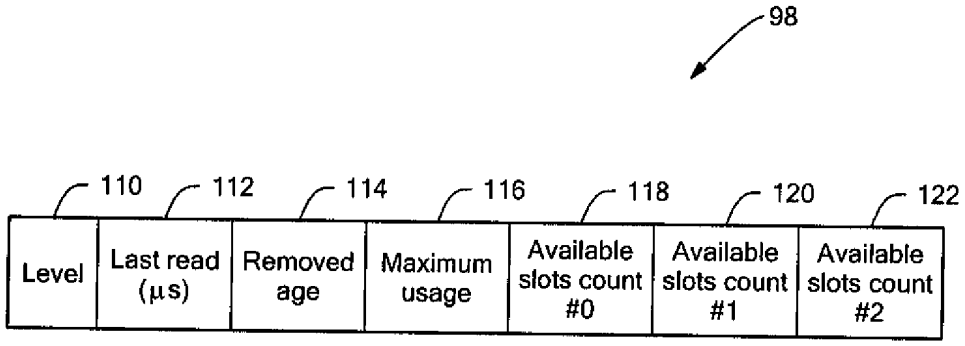
98
110
112
114
116
118
120
122
Level
Last read (μs)
Removed age
Maximum usage
Available slots count #0
Available slots count #1
Available slots count #2

FIG. 5A

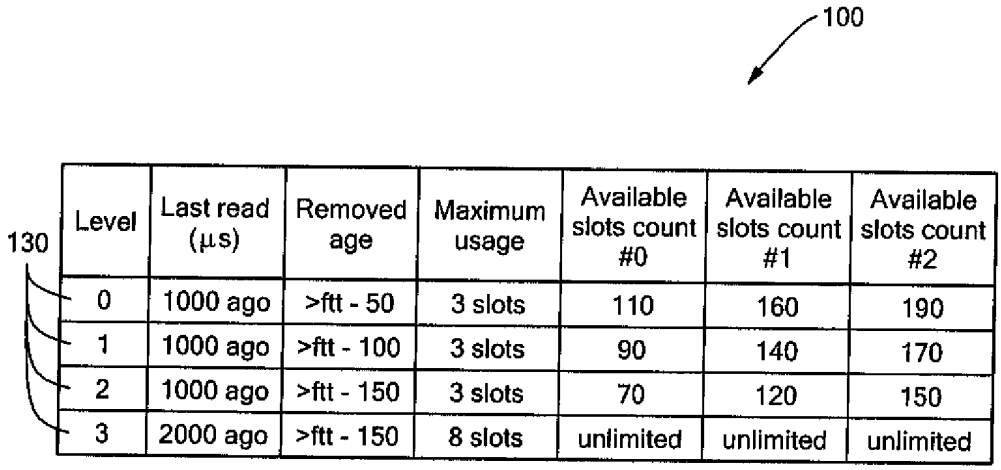
100
130
Level
Last read (μs)
Removed age
Maximum usage
Available slots count #0
Available slots count #1
Available slots count #2
0
1000 ago
>ftt - 50
3 slots
110
160
190
1
1000 ago
>ftt - 100
3 slots
90
140
170
2
1000 ago
>ftt - 150
3 slots
70
120
150
3
2000 ago
>ftt - 150
8 slots
unlimited
unlimited
unlimited

FIG. 5B

6/8

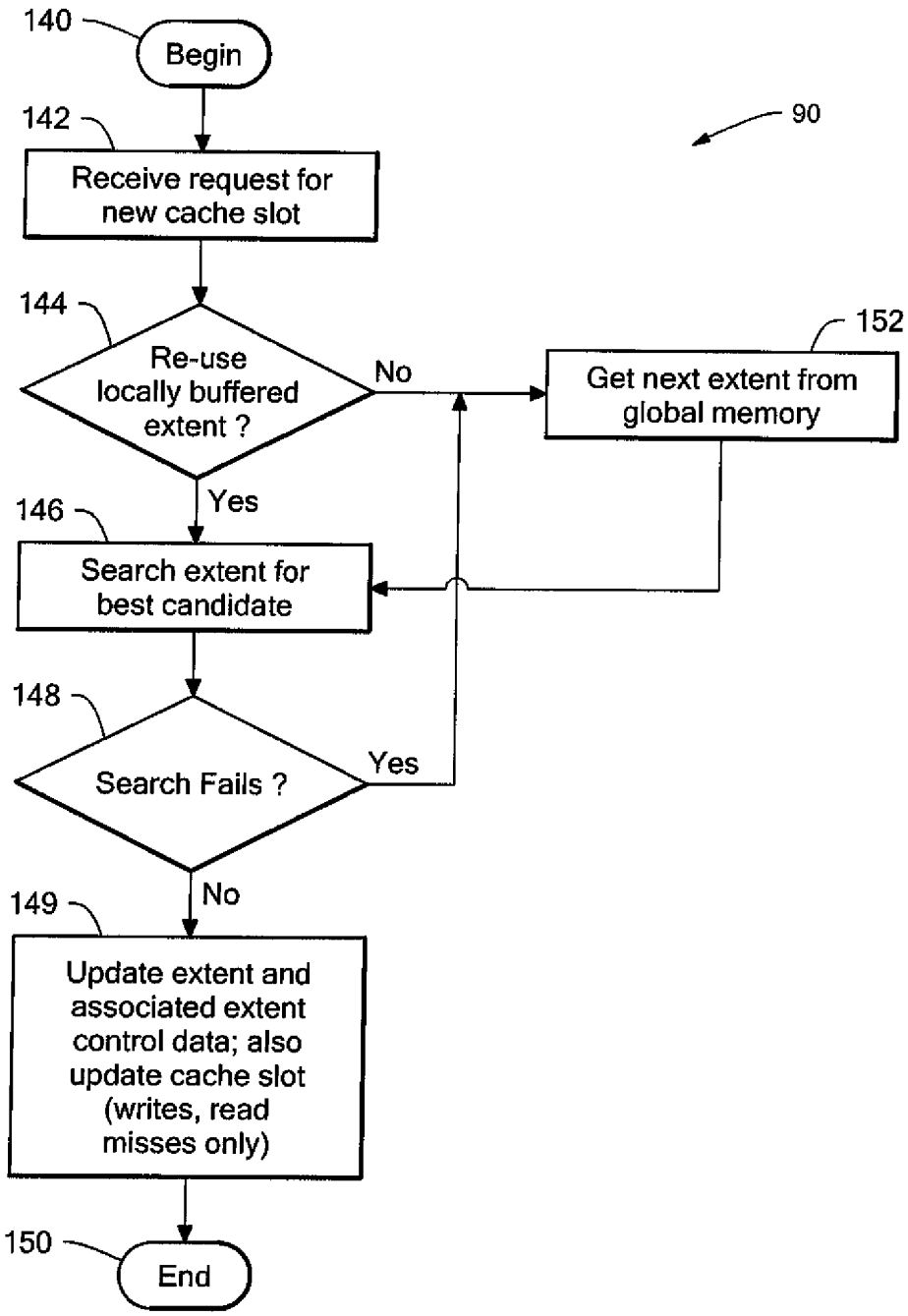
140
Begin
142
Receive request for new cache slot
90
144
Re-use locally buffered extent ?
No
152
Get next extent from global memory
Yes
146
Search extent for best candidate
148
Search Fails ?
Yes
No
149
Update extent and associated extent control data; also update cache slot (writes, read misses only)
150
End

FIG. 6

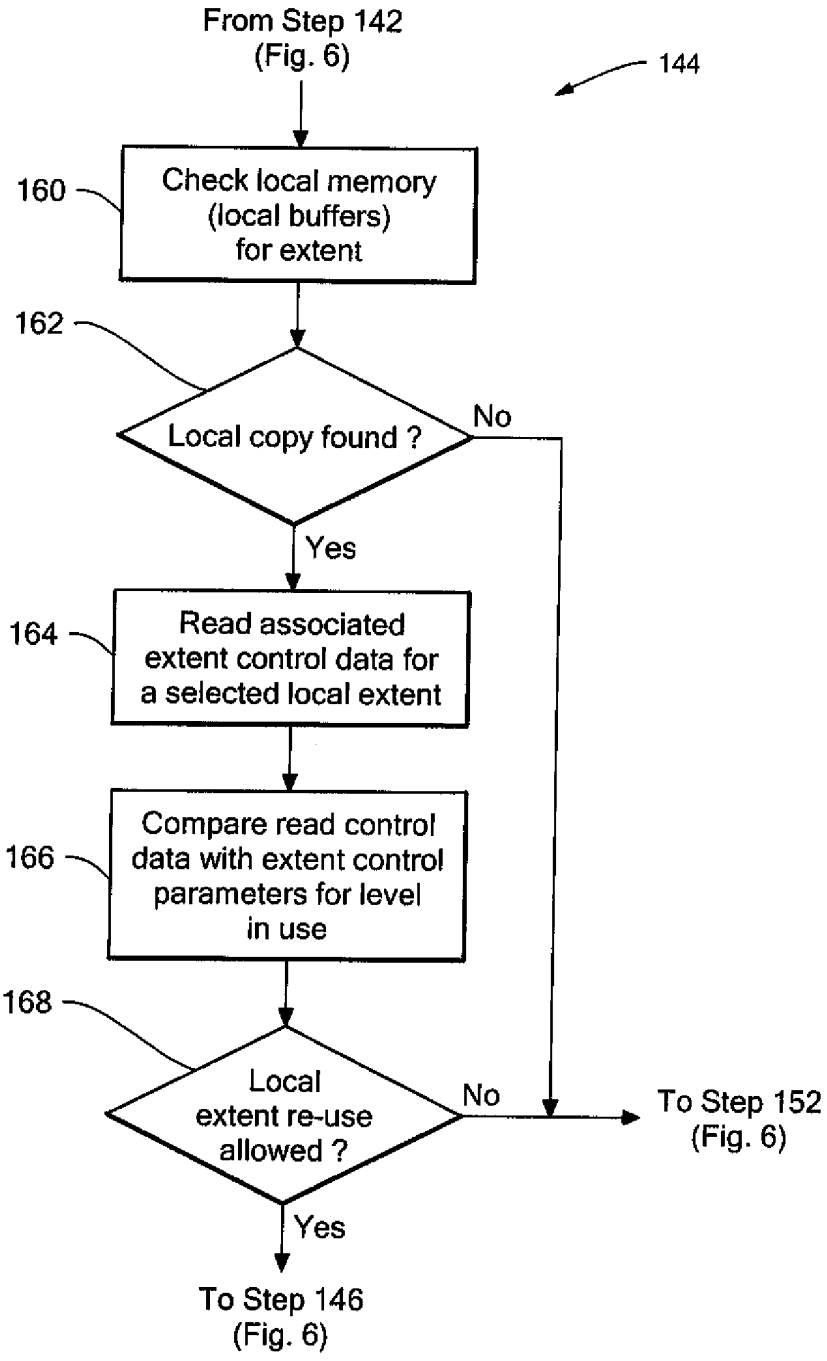
From Step 142
(Fig. 6)
144
160
Check local memory (local buffers) for extent
162
Local copy found ?
No
Yes
164
Read associated extent control data for a selected local extent
166
Compare read control data with extent control parameters for level in use
168
Local extent re-use allowed ?
No
To Step 152
(Fig. 6)
Yes
To Step 146
(Fig. 6)

FIG. 7

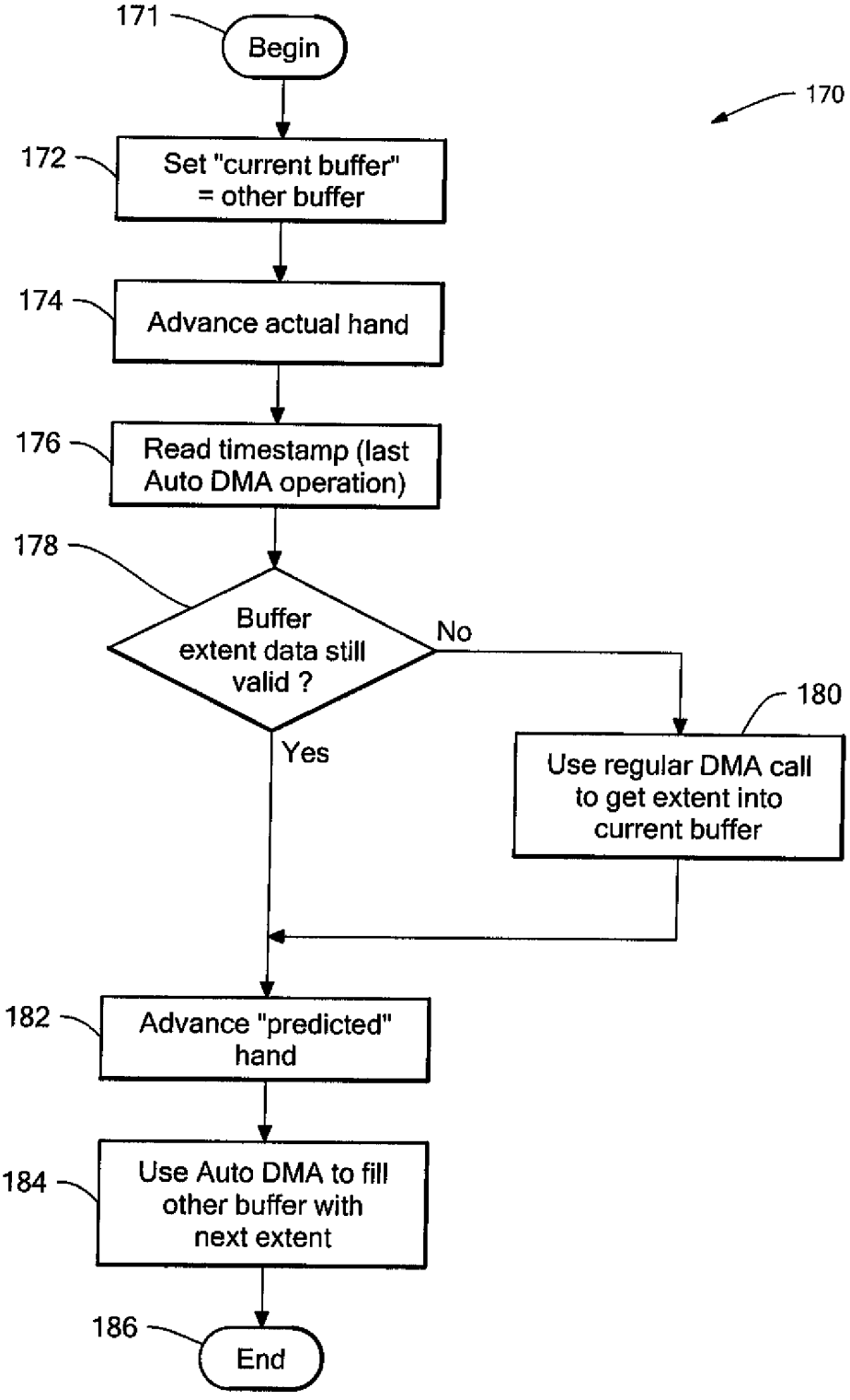
171
Begin
170
172
Set "current buffer" = other buffer
174
Advance actual hand
176
Read timestamp (last Auto DMA operation)
178
Buffer extent data still valid ?
No
Yes
180
Use regular DMA call to get extent into current buffer
182
Advance "predicted" hand
184
Use Auto DMA to fill other buffer with next extent
186
End

FIG. 8